

SCIENCE NEWS LETTER

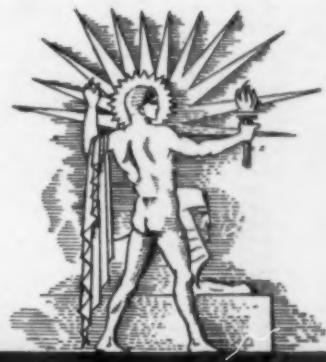
GENERAL LIBRARY
PERSONAL ROOM

THE WEEKLY SUMMARY OF CURRENT SCIENCE.



A Cat That Walks By Himself

See Page 378



DECEMBER 12, 1931

A

SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

VOL. XX

No. 557

The Weekly
Summary of



Published by

SCIENCE SERVICE

The Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science.

Edited by WATSON DAVIS

Subscription rates—\$5.00 a year postpaid; two years, \$7.00; 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Back numbers more than six months' old, 25 cents.

In requesting change of address, please give old as well as new address.

Advertising rates furnished on application.

Board of Trustees of Science Service

Honorary President, William E. Ritter, University of California. Representing the American Association for the Advancement of Science. J. McKeen Cattell, President, Editor, *Science*, Garrison, N. Y.; Burton E. Livingston, Johns Hopkins University, Baltimore, Md.; Raymond Pearl, Director, Institute for Biological Research, Johns Hopkins University, Baltimore, Md. Representing the National Academy of Sciences, W. H. Howell, Vice-President and Chairman of Executive Committee, National Research Council, Washington, D. C.; R. A. Millikan, Director, Norman Bridge Laboratory of Physics, California Institute of Technology, Pasadena, Calif.; David White, Senior Geologist, U. S. Geological Survey. Representing National Research Council, Vernon Kellogg, Permanent Secretary, National Research Council, Washington, D. C.; C. G. Abbot, Secretary, Smithsonian Institution, Washington, D. C.; Harrison E. Howe, Editor of Industrial and Engineering Chemistry. Representing Journalistic Profession, John H. Finley, Associate Editor, New York Times; Mark Sullivan, Writer, Washington, D. C.; Marlen E. Pew, Editor of Editor and Publisher, New York City. Representing E. W. Scripps' Estate, Harry L. Smithton, Treasurer, Cincinnati, Ohio; Robert P. Scripps, Scripps-Howard Newspapers, West Chester, Ohio; Thomas L. Sidlo, Cleveland, Ohio.

Staff of Science Service

Managing Editor, Watson Davis; Staff writers: Frank Thone, Emily C. Davis, Jane Stafford, Marjorie Van de Water, J. W. Young, D. Lindsay Watson; Librarian, Minna Gill; Sales and Advertising Manager, Hallie Jenkins.

Copyright, 1931, by Science Service, Inc. Reproduction of any portion of the SCIENCE NEWS LETTER is strictly prohibited since it is distributed for personal, school, club or library use only. Newspapers, magazines and other publications are invited to avail themselves of the numerous syndicate services issued by Science Service, details and samples of which will gladly be sent on request.

Members of the American Association for the Advancement of Science have the privilege of subscribing to the SCIENCE NEWS LETTER at the reduced price of \$3 per year. Application for this privilege should be accompanied by privilege card obtained from the Permanent Secretary, A. A. A. S., Smithsonian Institution Building, Washington, D. C.

Publication Office, 1930 Clifton Ave., Baltimore, Md. Editorial and Executive Office, Constitution Ave. at 21st St., N. W., Washington, D. C.

Address all communications to Washington, D. C. Cable address: Sciservc, Washington.

Entered as second class matter October 1, 1926, at the post-office at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

DO YOU KNOW THAT

7

The State of Virginia has approximately 3,000 miles of navigable fishing waters.

Autogiro boats are being introduced for naval service, both in this country and abroad.

All-metal bungalows made of steel and copper have been developed in Germany to sell for about \$1,000 exclusive of plumbing and other equipment.

An albino whitetail fawn has been observed in Glacier National Park, running with a normal colored doe which is believed to be its mother.

The ruby-throated hummingbird, smallest of our birds, flies 500 miles across the Gulf of Mexico on its spring and fall migrations.

A photo-electric tube is now used in one steel plant, to time the cutting of a shear that trims hot steel bars to the desired length.

A pelt taken in December is worth three taken pre-season.

Lignum-vitae got its name, "tree of life", because of a belief that its resin could cure serious disease.

The egg cell from which a whale grows is only twice as big in diameter as the egg cell that produces a mouse.

There were no muskrats in continental Europe prior to 1905; then a few were imported, and today there are said to be 100,000,000.

Citing the need for careful laundry practices, Canadian scientists point out that wool is an animal substance which may dissolve completely if washed incorrectly.

Tests made recently at Pennsylvania State College indicate that when a cloud of dust is blown into a room, 80 per cent. settles within two hours but some dust remains in the air after five days.

WITH THE SCIENCES THIS WEEK

| | | |
|--------------------------------|-----|--------------------------------|
| ARCHAEOLOGY | | NAVIGATION |
| Grand Stairway Unearthed | 371 | Echoes Tell Position |
| Oldest Town in U. S. | 377 | Method of Keeping a Journal at |
| ASTRONOMY | | Sea—"A Classic of Science" |
| Most Distant Visible Nebula | 379 | PALAEOBOTANY |
| Telescope Mirror Passes Tests | 377 | Signatures in Clay |
| BACTERIOLOGY | | PHOTOGRAPHY |
| Seeing Filterable Germs | 371 | Five-Lens Camera |
| BOTANY | | New Photographic Process |
| Science at World's Crossroads | 378 | PHYSICS |
| Winterberry—"Nature Ramblings" | 382 | Cosmic Ray Tracks |
| CHEMISTRY | | Disrupting Heart of Matter |
| Vitamins in Green Oranges | 377 | Eyes for Airplanes |
| ENGINEERING | | Good "Ear" Needed |
| Cools Defeat Machines | 376 | Hollywood Lights |
| Pulverized Coal as Fuel | 381 | PHYSIOLOGY |
| FORESTRY | | Measuring Vitamin Needs |
| Redwoods not Fireproof | 377 | PSYCHOLOGY |
| Wells for Fire Fighters | 382 | Measuring Winks |
| GENERAL SCIENCE | | PUBLIC HEALTH |
| Book Reviews | 384 | Cancer Varies with Nationality |
| MEDICINE | | REFRIGERATION |
| New Cancer Diagnosis | 376 | Frozen Fruit |
| New Pellagra Treatment | 372 | ZOOLOGY |
| MICROSCOPY | | Life of Riley for Chimpanzees |
| Seeing Filterable Germs | 371 | Science at World's Crossroads |

Science Service presents over the radio, an address

MARRIAGE AND FAMILY LIFE AMONG THE PLAINS INDIANS

By Dr. Robert H. Lowie, Chairman, Division of Anthropology and Psychology, National Research Council.

Friday, December 18, at 3:45 P. M., Eastern Standard Time

Over Stations of

The Columbia Broadcasting System

BACTERIOLOGY-MICROSCOPY

Filterable Germ Forms Seen With New Super-Microscope

Device Using Quartz Optical Parts Makes Possible First View of Organisms Rendered Filterable by K Medium

USING the new "super-microscope" invented by Dr. Royal Raymond Rife of San Diego, Dr. Arthur Isaac Kendall of Northwestern University Medical School has seen for the first time the exceedingly minute moving bodies that apparently carry the life of bacteria when these are induced to "dissolve" into a form that will pass through the pores of the finest porcelain filter and still remain alive and able to resume their microscopically visible bodies upon suitable treatment.

The work was done at the Pasadena Hospital, and will be reported in the official publication of the California Medical Association, *California and Western Medicine*.

The material used by Dr. Kendall was a culture of the typhoid bacillus, ordinarily a fairly large germ, easily visible under the higher-powered lenses of a compound microscope. By feeding it on his recently-evolved "K medium," which apparently has the power of causing all visible bacteria to pass over into an invisible, filterable phase, Dr. Kendall induced the bacilli in his cultures to go through this change. Under the highest power of the ordinary microscope, he could see nothing moving in the fluid, except a swarm of rather active little granules that were visible only as tiny motile points.

Small, Motile, Turquoise-Blue

Examined with the Rife microscope, however, these points became plainly visible as small, oval, actively moving bodies, turquoise-blue in color. These appeared in all the cultures, and could be transferred from one culture to another through the fine-pored filters; so Dr. Kendall considers them to be the actual filterable forms of the typhoid bacillus.

He put them to another, more definitely crucial test. Reasoning that since they were all that were to be found in "K medium" cultures of more than eighteen hours' growth, he might find them in an intermediate state in younger cultures, he tried examining samples from cultures exactly eighteen hours old.

In these he found both full-sized bacilli still unchanged, and his small, turquoise-blue bodies, and in addition there were peculiarly altered bacilli within whose substances the turquoise-blue bodies could be seen. These he holds to be bacilli caught in the act of changing from the filterable to the non-filterable phase.

This visual demonstration of the hitherto invisible, living and moving particles of the filterable phase of a bacillus is hailed editorially by *California and Western Medicine*. Of Dr. Rife's microscope the editorial says:

"Whereas our present microscopes magnify from one to two thousand diameters, in this new microscope we have an instrument for which a magnification as high as seventeen thousand diameters is claimed. This is certainly a long stride from the initial efforts of Van Leeuwenhoek, whose simple instrument may be said to have laid the foundation for the science of bacteriology which later came into being; and by means of which science much of the world's progress in man's conquest of

the infective and other diseases has been made possible."

In the forthcoming article only meager details of the new microscope itself are given. It is made known, however, that all the optical parts are of quartz instead of the usual glass, that attachments make possible spectroscopic examinations and motion pictures of the material under the lens, and that magnifications up to seventeen thousand diameters are possible. The work on Dr. Kendall's filterable typhoid germs was done at a magnification of five thousand diameters.

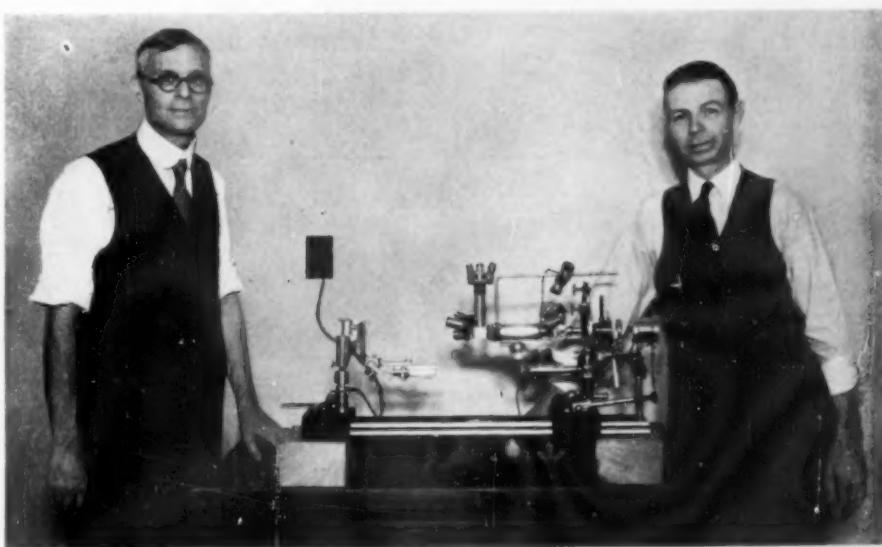
The light used with Dr. Rife's microscope is polarized, that is, it is passed through crystals that stop all rays except those vibrating in one particular plane. By means of a double reflecting prism built into the instrument, it is possible to turn this plane of vibration in any desired direction, controlling the illumination of the minute objects in the field very exactly. Further details regarding the mechanical construction and the optics of the sensational new instrument are promised soon.

Science News Letter, December 12, 1931

ARCHAEOLOGY

Grand Stairway Unearthed In Ruins of Monte Alban

DIGGING in the principal plaza of the old ruined city of Monte Alban, a Mexican archaeologist, Alfonso Caso of the Mexican National Museum, has unearthed a grand stairway 130 feet in width. Monte Alban was a city



TO 17,000 DIAMETERS

Magnifications as great as this are claimed for the new Rife microscope, which made visible the hitherto unseen living particles in the filterable stage of the typhoid bacillus. At left, Dr. Arthur I. Kendall, Northwestern University Medical School; right, Dr. Royal Raymond Rife of San Diego, who built the instrument.

built by Zapotec Indians and abandoned before the Spanish Conquest.

The stairway which has been cleared gave access to a platform in the city plaza. To reach the platform, the people of old Monte Alban climbed thirty-five steps.

It was a common practice in Mexico to enlarge old structures when they became too small by covering them with an outer shell. This was done at the stairway of Monte Alban. Beneath the stairway first discovered, the archaeologists have found an older, inner stairway which appears to be intact and superior in construction to the newer,

outer stairway. The outer stairs were in their turn concealed by an even later set, but only traces of these can be seen.

At each end of the big platform are mounds, formed of a series of small superposed platforms. One of these mounds still has the stumps of a temple on top.

Monte Alban is a complicated system of such mounds on top of terraces and platforms, placed symmetrically about sunken courts or other structures. These were built at various levels along a high mountain ridge. From the valley below, the serrated effect of the prehistoric city's sky-line may still be seen.

Science News Letter, December 12, 1931

PHYSICS

Airplanes See Through Fog With New Photocell Device

THE PHOTOELECTRIC cell, magic eye of science, has penetrated blaneting fog with an effectiveness thousands of times that of the human eye and so gives promise of enabling the aviation industry to overcome one of its greatest handicaps.

This and other important facts about aviation light signals have been learned from studies at the General Electric Research Laboratory by Dr. Irving Langmuir, who first filled the vacuum of electric lamps with rare gases to make them shine brighter and last longer, and his associate, W. F. Westendorp. They reported results of their work before the annual meeting of the American Society of Mechanical Engineers.

A device was described which, it was said, will enable a photoelectric cell on an airplane to "see" through dense fog, light beacons on the ground entirely invisible to the eye of the pilot and thus enable the pilot to hold to his course.

Far More Sensitive

Its operation depends chiefly on the fact that the photoelectric cell is thousands of times more sensitive to diffused light—and all light from the ground will be diffused by fog—than the human eye.

To make sure that this super-sensitive electric eye will report airplane beacons and not just any lights on the ground, Dr. Langmuir and Mr. Westendorp suggested feeding special beacons with a 1000-cycle current so that they will give a rapidly flickering light. Since other

lights use either a 60-cycle or direct current, it will be possible to isolate the 1000-cycle signals and use only these for direction purposes.

Indicative of the extreme sensitivity of the photocell, the scientists said that even in full moonlight the photocell can detect a diffused modulated light of an intensity only one-thirteenth-thousandth of that of a diffused flashing light just visible to the eye.

Science News Letter, December 12, 1931

MEDICINE

Reports Success With New Treatment for Pellagra

A REMARKABLY successful method of treating pellagra, based on a new theory of its cause, has been reported by Dr. Ibrahim Sabry, skin specialist of the Government Hospital at Alexandria, Egypt, to *Lancet*, medical journal published in London.

Dr. Sabry's method consists simply of daily injections into the veins of a small amount of a sterilized solution of a common chemical, sodium thiosulphate.

The skin lesions which are a distressing feature of pellagra are checked in early cases after only a few injections and disappear quickly in late and lingering cases, Dr. Sabry claims. Gangrenous limbs, sometimes seen late in the course of the disease, soon heal under this treatment. Other symptoms clear up as the disease yields to treatment. From 20 to 60 injections are needed. So far



SIGNATURES IN CLAY

Some of the most important of early historic documents have been found inscribed on tablets of clay, in the buried ruins of cities that were the abodes of kings and gods when Sumer and Akkad were young. Not less important are the signatures in clay, since hardened into stone, that tell some of the tales of the unmanned world, ages before even the dinosaurs wallowed in the swamps and crashed through the underbrush. The waste-heaps of many soft coal mines will yield abundant flattened-oval lumps of shale which, struck carefully on their edges, will split apart and disclose leaf or stem or fruit. This one yielded, for the inspection of Cornelius Clarke's camera lens, a perfect fern leaf.

no complications have been met with.

Dr. Sabry considers these facts sufficient grounds for contesting utterly the idea that pellagra is caused by vitamin deficiency, since no disease due to deficiency of a vitamin has ever been known to improve without supplying the lacking vitamin, and certainly not from the mere introduction into the body of a drug that cannot contain any vitamin.

Instead, Dr. Sabry believes that the symptoms of pellagra are due to the presence in the body of a poison belonging to a chemical group having the name dioxypyrenylalanine. This is closely related to tyrosine, which occurs normally in the body.

Dr. Sabry claims that the pellagra toxin which he calls "dopa" has been obtained from the vegetating seeds of beans. He therefore attributes pellagra in Egypt mainly to the eating of beans.

Science News Letter, December 12, 1931

PHYSICS

Speedy Particles Released As Cosmic Rays Smash Atoms

Millikan Associate Provides First Evidence That Electromagnetic Radiation can Disrupt Heart of Matter

THE INCESSANTLY penetrating cosmic rays that bombard the earth from the depths of outer space smash the hearts of atoms and let loose speedy particles, Dr. Robert Andrews Millikan, Nobel prize physicist of the California Institute of Technology, announced in New York upon his return from a two and a half months' good-will trip to Germany and other parts of Europe.

Disintegration of the atomic nucleus by the cosmic rays was discovered by Dr. Carl D. Anderson, an associate of Dr. Millikan at the Norman Bridge Laboratory of Physics at Pasadena, during research planned jointly by Drs. Millikan and Anderson. The results were communicated to Dr. Millikan while abroad so that he might discuss their import with physicists who have been studying atomic disintegration at the Cavendish Laboratory at Cambridge for the past decade.

Lacked X-Ray Intensity

Dr. Anderson's experiments provide the first scientific evidence that electromagnetic radiation can disrupt the innermost structure of matter. Artificial breaking down of elements has been accomplished in the past by the impact of alpha radiation from radium, which consists of rapidly speeding hearts of helium atoms. Heretofore scientists have not had at their disposal any X-rays or gamma rays of sufficient intensity or shortness to disrupt the tightly bound hearts of elements.

Cosmic rays, with energies of 100,000,000 to 300,000,000 volts, are extremely penetrating X-rays or gamma rays and provide an automatic tool for bombarding and smashing the atomic hearts. In his experiments Dr. Anderson found that cosmic rays knock both negative and positive electrons and protons out of the nuclei of oxygen and nitrogen. He used the famous Wilson cloud chamber apparatus in which the collision of cosmic radiation with atoms of gas is made visible by a line of small water droplets. The electrons or particles of electricity that are reemitted

from the collision travel at immense speeds—99.9 per cent. of the velocity of light, which is 186,000 miles per second. The protons or hydrogen nuclei also are given great velocities equal to half the velocity of light, or 75,000,000 volt electrons. These values provide physics with new speed records.

Dr. Millikan predicted that Dr. Anderson's bombardment experiments would be useful in understanding the fundamental nature of matter. It is another demonstration that transmutation of the elements, long considered an alchemistic dream, is possible in some cases. In Dr. Anderson's experiment hydrogen, simplest of elements, is obtained from the gases oxygen and nitrogen; although the quantities are of no practical importance.

Intensive research on cosmic rays now in progress in Germany is confirming, Dr. Millikan found, his conclusion that cosmic rays come to earth with equal intensity from all parts of the sky. Dr. E. Regener of the University of Stuttgart, by sinking electrosopes to thousand foot depths in the Bodensee, has ex-

tended and confirmed Dr. Millikan's own finding on the penetrating power of the most intense cosmic rays. Dr. Millikan visited Dr. Regener during his travel in German-speaking European countries as the guest of the Oberlaender Trust.

He also found Dr. F. Hoffman of Halle in complete agreement with him on cosmic rays. As a result of his extensive visits in Germany, Dr. Millikan declared that progress in physics is being accelerated in that country.

"We have much to learn from Germany and Germany has much to learn from us in physics," he said.

Science News Letter, December 12, 1931

REFRIGERATION

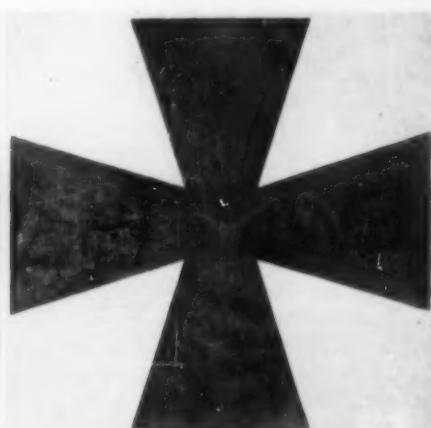
New Type of Frozen Fruit being Developed

A NEW TYPE of frozen fruit, which not only will appeal to the palate but also will offer a new outlet for the fruit grower and packer, is being developed by the Food Research Division of the Bureau of Chemistry and Soils, U. S. Department of Agriculture.

By pulping the pitted fruit, adding a sugar syrup, mixing it thoroughly and then freezing it at very low temperatures, Department chemists have developed this frozen fruit product which they claim has a remarkably smooth texture and fully retains the original flavor.

Science News Letter, December 12, 1931

Sweet apple cider contains about the same food value as fresh apples.



U. S. Army Air Corps

AERIAL MAPPING WITH FIVE-LENS CAMERA

A recent development in aerial photography is a camera, shown at left, which has four oblique lenses in addition to the usual vertical center lens. Operation of these lenses is simultaneous. In developing the exposed film, a special instrument is used which enlarges the wing pictures, and projects them on the same plane with the center view. Right shows a photograph of Dayton, Ohio, and vicinity made with the new camera. On an experimental mapping tour conducted not long ago aviators of the Army Air Corps were able in two days flying to cover an area which would require six months with usual equipment, and at one-thirtieth the cost allowed for such work.

NAVIGATION

Method of Keeping a Journal at Sea

"A Classic of Science"

**For 130 Years the Almost Yearly Editions of "Bowditch"
Sum up the History of Navigation from Sail to Turbines**

THE NEW AMERICAN PRACTICAL NAVIGATOR; being an Epitome of Navigation; containing all the tables necessary to be used with the Nautical Almanac, in determining the Latitude; and the Longitude by Lunar Observations; and keeping a Complete Reckoning at Sea; illustrated by proper rules and examples: the whole exemplified in a Journal, kept from Boston to Madeira, in which all the rules of navigation are introduced . . . By Nathaniel Bowditch. First Edition. Printed at Newburyport, (Mass.) 1802, by Edmund M. Blunt, (Proprietor) for William R. Wilder, Newport.

A SHIP'S RECKONING is that account, by which it can be known at any time where the ship is, and on what course or courses she must steer at to gain her port. DEAD RECKONING is that account deduced from the ship's run from the last observation.

The daily occurrences on board a ship are marked on a board or slate, called the log-board, or log-slate, kept in the steerage for that purpose, which is usually divided into seven columns; the first contains the hours from noon to noon, being marked by some for every two hours, but by others for every single hour; in the second and third columns are the knots and fathoms the ship is found to run per hour, set against the hours when the log was hove. Some navigators do not divide the knot into ten fathoms, but into half knots only, marking the third column H. F. The fourth column contains the courses steered by compass; the fifth, the winds; the sixth, the leeway; and in the seventh, the alteration of the sails, the business done aboard, and what other remarks the officer of the watch thinks proper to insert. For it should be observed, that it is usual to divide a ship's company into two parts, called the starboard and larboard watches, who do the duty of the ship for four hours and four hours, alternately, except from 4 to 8 P. M. which is divided into two watches.

—The remarks made on the log-board are daily copied into a book called the LOG-BOOK, which is ruled like the log-board. This book contains the only authentic record of the ship's transactions, and the persons who keep a reckoning transcribe them into their journals, and from thence make the necessary deductions relative to the ship's place. There are various ways of keeping these journals, according to the different tastes of navigators. Some keep only an abstract of each day's transactions, specifying the weather, what ships or lands were seen, accidents on board, the latitude, longitude, course, and run: these particulars being drawn from the ship's log-book. Others keep a full copy of the log-book, and the deductions drawn therefrom, arranged in proper columns at the bottom of it: this is the most satisfactory method to those who may have occasion to inspect it, and we have adopted it in the following journal, but shall give an abstract at the end conformable to the former method.

When a ship is about losing sight of the land, the bearing of some noted place (whose latitude and longitude is known) is observed, and its distance estimated and marked on the log-book: this is called *taking a departure*. In working this first day's work, the calculation is made in the same manner as if the ship had sailed that distance, from that place, upon a course opposite to its bearing; and it is entered accordingly into the Traverse Table, after correcting it for the variation. The other courses sailed till the following noon (which ends the sea day, as we have before observed), corrected for the variation, are also put in the Traverse Table, with their corresponding distances. From hence the latitude and longitude of the ship are found, and are marked in the journal. The next and following days' work are calculated in a similar manner; finding the latitude and longitude of the ship by means of her latitude and longitude at the preceding noon.

Having thus explained the general



NATHANIEL BOWDITCH (1773-1838)
American practical navigator who pursued mathematics as an avocation, translated Laplace's "Mechanique Celeste", and refused a Harvard professorship.

manner of keeping a ship's journal, we shall now give a number of examples—Of allowing for the variation; of the estimation and allowance for leeway; of the rules for correcting the dead reckoning by an observation—and then will follow a number of single day's works, and a continued journal of a voyage from Boston to Madeira, in which the various rules of Navigation will be exemplified.

To Allow for the Variation

We have already taught the methods of finding the variation, which must be allowed on all courses steered, and on all bearings taken with the compass: *to the right hand, if the variation be*

CHARLES DARWIN
His father was afraid it would ruin his reputation and unsettle his ambition to be a clergyman, if he went to sea. But 100 years ago this month

Voyage of the Beagle.
a sea-sick youth of 23, set out on the

THE NEXT CLASSIC OF SCIENCE

east; but to the left hand, if it be west; the observer being supposed to be placed in the centre of the compass, looking towards the point on which the variation is to be allowed. . . .

To Find the Leeway and Allow for it

Leeway is the angle the ship's real course makes with her intended course, occasioned by contrary winds or a rough sea; and may be estimated by observing the angle which the wake of the ship makes with the point right a-stern, or in the direction of her keel. This may be done by a compass cut in lead (or other metal) on the poop, or some other convenient part of the ship's stern. It would be very conducive to the accuracy of a ship's reckoning, if the leeway was marked on the log-board every watch, according to an estimation made at the time, instead of leaving it till the day's work is calculating, and then guessing at it, as is the general practice.

Leeway is to be allowed on all courses steered, in the following manner: Count the nearest way of the compass from the wind to the course set, and as many points and parts beyond as the leeway amounts to, and it gives the correct course: or, allow it to the right hand of the course steered when the larboard tacks are aboard, and on the left hand when the starboard tacks are aboard, the person making the allowance being supposed to be looking towards the point of the compass the ship is sailing upon.

To Correct the Dead Reckoning

After having calculated your day's work, you must compare the latitude by dead reckoning with the latitude by observation; if they agree your day's work is probably correct, but if they differ you must try to discover the causes of it. Examine your log-line and half-minute-glass, to find whether the distance is given exactly by the log; inquire whether the ship came-to or fell-off her course, by bad steerage or sudden squalls, etc.; see if you have made sufficient allowance for variation and leeway; but above all, you ought to discover (if possible) whether there is a current, with its setting and drift. If, after making proper allowance for these things, there is still a difference between the latitude by dead reckoning and by observation, and you feel confident that the error does not arise from an unknown current, you may make a further correction, depending on the following principles: When the course is within three points of the meridian, the error is probably in the distance, because it

ADVERTISEMENT

The decided preference given the American editions of the "New Practical Navigator" [by John Hamilton Moore] since its appearance in 1799, calls on the proprietor for his acknowledgements of gratitude. To the honour of the American mariners, and through the good offices of the American book-sellers, be it said, that within two years seven thousand copies have been sold in the United States. He was preparing to put a third edition of the same work to press, but has since been induced to relinquish Moore's treatise for the present more correct and perfect work, furnished by Mr. Bowditch.

While he is tendering his thanks to such as have assisted in the establishment of the work, it would be highly criminal to omit those due to John Hamilton Moore; and with the greatest frankness it is acknowledged that he contributed largely to its establishment, as his late editions have been so erroneous that no person would hazard his interest, much less life, in navigating his vessel by the rules there laid down, and it is well known that in all the English West India islands the American edition has invariably been purchased when a supply could be obtained.

EDMUND M. BLUNT.

Newburyport, Jan. 1802.

AN ADVERTISEMENT FOR THE "NEW PRACTICAL NAVIGATOR"

would require a greater error in the course, to cause that difference of latitude, than can be supposed probable to have been committed.—When the course is above five points from the meridian, the error is probably in the distance, because a small error in the course would cause a considerable error in the difference of latitude, but an error in the distance would affect it but little. When the course is between three and five points, the error may be either in the course, or in the distance, or in both; and an allowance ought to be made on both of them.

To Correct for Several Days

The preceding rules will serve for correcting any single day's work; but if an observation has been wanting for several days, you must proceed in the following manner.

Take the latitude by observation and longitude in at the time of last observation (or the latitude and longitude of the place you took your departure from, if you have had no observation since) and also the latitude in by observation, and the longitude by account; find the differences of these latitudes and longitudes, and the middle latitude; with the middle latitude and difference of longitude, find the departure; with this departure, and the difference of latitude by account (which is found by taking the difference between the latitude left by observation and the latitude in by account) find the course and distance corresponding, and see what case this course falls under, and correct the de-

parture by it; then having the correct departure, you may find the true difference of longitude and longitude in. . . .

A journal being kept in the preceding manner, the situation of the ship may be known nearly at any time, and the bearing and distance of the place of destination may be found. When the mariner is fearful that his longitude by account is inaccurate, and he has no lunar observations to correct it; he must get into the latitude of the place, and (if possible) run east or west according to his situation and the prevailing state of the winds.

[The "Journal of a Voyage from Boston to Madeira" is too long and too mathematical to reprint in this place, but those interested will find it still being used, 130 years after, to illustrate text-books on the principles of navigation.—Ed.]

Science News Letter, December 12, 1931

PHYSICS

Need Good "Ear" to Play Fixed-Key Instruments

FLUTES, bassoons, trumpets or other wind instruments with fixed finger keys need players with just as good an "ear" as violins or slide trombones where the notes are not made at a fixed position. This result was announced at Cleveland to the Acoustical Society of America by John B. Taylor of the General Electric Company.

The player's mouth cavity, whose air vibrates in tune with that in the column of the instrument, gives him the means of sharpening or flattening at will the note produced, it was explained.

Science News Letter, December 12, 1931

MEDICINE

New Blood Test Used In Diagnosis of Cancer

A NEW METHOD of detecting cancer in its early stages has been developed by Dr. Hans Jacques Fuchs, member of the physiological institute of the Veterinary University of Berlin. An account of the new method has been given by Dr. Fuchs to a Science Service correspondent at Berlin. Details will be published in a few months in a German scientific journal.

So far, two thousand cases have been successfully diagnosed by the new method, the diagnosis being confirmed by operation or dissection. The method also makes it possible to determine the presence of cancer when an infectious disease occurs at the same time. Further, it is claimed that by this method the success of surgical or radiological treatment of cancer can be controlled.

The new method depends on the digestion of serum from the blood of a suspected cancer patient with fibrin prepared from the blood of a normal person and with fibrin from the blood of a person known to have cancer. The digestion goes on for ten hours at a temperature of 104 degrees Fahrenheit. The protein is then removed from these samples and the amount of non-protein nitrogen present in each is determined. Depending on the amount of non-protein nitrogen present, it is possible to make a diagnosis as to whether the suspected case is one of cancer or not.

The new method is the result of five years of incessant research work during the course of which Dr. Fuchs had to make a number of pieces of special apparatus in order to achieve the necessary exactness in his determinations. The method also marks the first time that a chemical determination of a serological process has been made.

Science News Letter, December 12, 1931

NAVIGATION

Ships Bounce Noises To Learn Positions

THE OLD-TIME skipper was rather helpless in a fog or other thick weather. If he couldn't look upward and see the sun or a star he couldn't determine his position. But his modern successor just bounces a noise off the bottom of the sea and gets a very good idea of where he is.

How this is done was explained in a radio talk broadcast under the auspices

of Science Service, over the network of the Columbia Broadcasting System by Commander G. T. Rude of the U. S. Coast and Geodetic Survey.

A specially equipped vessel of the Survey, formerly J. Pierpont Morgan's yacht *Corsair II*, but now known as *Oceanographer*, has been making detailed and accurate depth charts of the inshore waters along the Atlantic coast of the United States, working largely with the new sonic depth-finding apparatus. So thoroughly has this work been done over areas traversed by many steamer tracks that now it is possible for commercial vessels to determine their positions at least approximately by starting a sound toward the bottom, and then detecting its echo by means of an electrical ear called the hydrophone. Since the speed of sound in water is known and is fairly constant, the elapsed time can be automatically expressed in terms of depth in fathoms.

Most large steamships have this depth-finding apparatus constantly in operation, so that by checking its reports from time to time against a contour map of the bottom it is possible to form a pretty good idea of the ship's position and course, without a glimpse of the heavenly bodies that are the navigator's usual aids.

Science News Letter, December 12, 1931

PSYCHOLOGY

Length of Winks Is Measured by Scientists

IF A FAINT RAY of sunlight falls on your face in the morning just before the alarm clock sets up its clatter, your response should be very much greater than if the clock did its noisy work alone. This, at least, would seem to be an everyday illustration of the principle of psychology which has just been made clear by experiments reported by Ernest R. Hilgard of Yale University.

Mr. Hilgard's investigation consisted in measuring the length of winking responses to sounds and lights. He found that if a faint light is presented to the human eye, the subject winks slightly, the wink averaging only four millimeters in extent when measured by special photographic apparatus. If a loud sound is the stimulus, the subject winks much harder, in an eyelid response twenty millimeters long. But if the loud sound is preceded within a twentieth of a second by a faint light, the response is greatly exaggerated. The wink then is lengthened to 31 millimeters or more.

Science News Letter, December 12, 1931

ZOOLOGY

Chimpanzees in Wild State Not Forced to Use Brains

LIFE for the chimpanzee in his native wild state is too easy to make it necessary for him to exercise his rather superior intellectual equipment, Prof. Henry W. Nissen of Yale University declares. He has been making a study of chimpanzees in their natural home in French Guinea.

The apes find food and water in great abundance, Prof. Nissen observed. Their diet agrees with them perfectly, evidently, because these creatures, which like all caged animals, have rather uncertain health in captivity, are practically never ill in the wild state.

Even the play of the wild chimpanzee does not include the ingenious "monkey-shines" so characteristic of the animal in captivity. Dr. Nissen says:

"For the limits of anthropoid intelligence we shall probably have to look to laboratory experiments, where we can make complex behavior the requisite for attainment of a goal. In the bush, on the other hand, we may expect to find the fullest expression of the emotional and social life of these animals."

Science News Letter, December 12, 1931

ENGINEERING

Coolies Defeat Machines In Excavation Battle

WHILE man is fighting man in the Far East, man also fights the machine. He has just won a partial victory over his inanimate foe.

Sixteen steel and concrete factory buildings and a steam power plant were recently completed at Chosen, in northern Korea. Latest American construction methods and equipment were used, except for excavation work, *Civil Engineering* reports in its current issue.

Korean and Chinese laborers, directed by Japanese foremen, developed such efficiency in handling dirt in shoulder baskets that machines beat a hasty retreat. The laborers could do the job two-thirds cheaper.

Science News Letter, December 12, 1931

IN SCIENCE

SCIENCE FIELDS

CHEMISTRY

Oranges Have Vitamin C Despite Early Picking

THE AMOUNT of scurvy-preventing vitamin C contained in oranges and grapefruit is not affected by the season at which these fruits are picked, investigations at the Lister Institute by Mary Forest Bracewell and Dr. Sylvester Solomon Zilva have shown. Oranges and grapefruit are commonly picked while the skin is still green and both fruits are used as sources of vitamin C.

The antiscorbutic activity of the juice of both fruits was found to be the same whether the fruit was picked at the beginning or end of the season. Moreover, there was not much loss of vitamin when the fruit was stored under ordinary conditions for about two months.

Conditions of cultivation, origin of stock, age of tree and type of soil were found to have practically no effect on the vitamin content of the fruit.

Science News Letter, December 12, 1931

FORESTRY

Forester Says Redwood Trees Are not Fireproof

C OMPLEACENCE on the part of Californians in the face of forest fires among the redwoods is not justified, in the opinion of Emanuel Fritz, associate professor of forestry at the University of California. Because the thick porous bark of redwoods is highly resistant to fire, many persons in the redwood region believe religiously that "fire can't hurt a redwood"; and they even deliberately set fires in the woods on the theory that they clear away the lesser growth and "give the trees a chance."

But repeated fire can burn thin even the thickest of redwood bark, Prof. Fritz has found in his years of study in the forests, and at last the heat reaches the cambium, or delicate growing tissue that makes new wood. It either kills it outright, or stimulates abnormal growths to meet the abnormal conditions. The final result is either a dead redwood, or one with "goosepen" cavities in its massive trunk, weakening

the tree while it stands, inviting further fire and fungus damage in the cavity, and greatly reducing its value as lumber.

Fire also causes retrogressive changes in the type of forest, Prof. Fritz declares. By thinning out the redwoods it permits trees of lower value to come in, which could not normally get a chance to grow in the deep shade of the forest giants. This not only cuts down the dollar-and-cents value of the timber, but also reduces the attractiveness of the forest to tourists; and, Prof. Fritz believes, the lumber companies "have a stake in tourist travel as much as they have in timber."

Prof. Fritz's discussion is presented in full in the *Journal of Forestry*.

Science News Letter, December 12, 1931

ASTRONOMY

Big Telescope Mirror Passes Final Tests

A FTER PASSING satisfactorily the most exacting tests that leading optical experts were able to devise, the greatest all-American telescope mirror, 69 inches in diameter, is now complete, ready to be brought to Delaware, Ohio, and installed on the world's third largest telescope, Dr. H. T. Stetson, director of the Perkins Observatory of Ohio Wesleyan University, has announced.

It is now in the shops of J. W. Fecker, in Pittsburgh, where the crude disc of glass, made in Washington at the U. S. Bureau of Standards, was figured to the proper curve, correct to less than a millionth of an inch. It will be brought to Delaware within the next few weeks. The telescope mounting has been ready for some months.

The disc of glass was received at the optical shops in September, 1928. Some sixteen thousand hours of work have been spent on it, not including the long and tedious hours of waiting. These were required after it had been warmed by the grinding process, in order that it might be cool for testing. Dr. Stetson was assisted in the final tests of its accuracy by Dr. J. S. Plaskett, Director of the Dominion Astrophysical Observatory, Victoria, B. C., where the second largest telescope was erected under Dr. Plaskett's supervision, and by Dr. I. C. Gardner, Chief of the Optical Section of the Bureau of Standards. Except for the Victoria instrument, the new Perkins Observatory reflector is exceeded only by the 100-inch mirror at the Mt. Wilson Observatory, in California.

Science News Letter, December 12, 1931

PHYSICS

Bright Lights Have Short Hollywood Life

BRIGHT incandescent electric lights that illuminate the sound recording of the thrilling talkie scenes are allowed to burn away less than a third of their useful life before they are discarded.

This Hollywood practice was revealed as a sound economy by a paper presented before the Acoustical Society of America by General Electric Lamp Development Laboratory engineers, C. Severin, E. M. Watson, and H. I. Wood.

Failure of a single lamp while filming a sound movie track may cause the re-taking of the scene at a cost of several thousand dollars. Automatic replacement of a dead lamp, practiced in projectors with success, is too slow and spoils a recording. The engineers therefore make it a rule to replace the recorder lamps when they have burned only 30 per cent. of their average useful life, since experience shows few failures up to that age.

Science News Letter, December 12, 1931

ARCHAEOLOGY

Oldest Town in U. S. Dates Back 561 Years

T O A LITTLE town in northeastern Arizona science would award the honor of being the "oldest continuously inhabited town in the United States."

The town is Oraibi. Its record-breaking antiquity has been determined by means of the tree-ring calendar by which scientists have been able to set specific dates on many prehistoric Pueblo settlements in the Southwest.

Dr. A. E. Douglass, astronomer, of the University of Arizona, and originator of the tree-ring studies, has returned to Tucson from Oraibi bringing the latest specimens of timbers from that place, and he has made final observations in dating the wooden beams of Oraibi.

He has collected about 275 beams which show that Oraibi was inhabited from the year 1370 A. D. until 1770. From 1770 there are written records showing that the town continued to exist. The Indian tribe now living at Oraibi is said to be composed of direct descendants of the town's founders.

Dr. Douglass is convinced that Oraibi is the only settlement in the United States that has proof of such long continuous habitation, and he will urge the government to mark the place properly.

Science News Letter, December 12, 1931

BOTANY-ZOOLOGY

Science at the World's Crossroads

Newly-Opened Forest Reserve and Experimental Gardens In Canal Zone Have Both Scientific and Economic Value

By FRANK THONE

PANAMA means, to most of us, two things. First and foremost, it means Modern Commerce—the merchant fleets of the world threading their way along a silver string of water lifted by the mighty magic of engineering over the tropic hills that separate two oceans. Back of that it means Old Romance—swarthy Dons guarding trains of slaves with backloads of treasure, or the slashing, cursing buccaneer crew of Morgan landed for rapine and pillage among the terrified towns.

But now, to the commerce of the present and the history of the past it is becoming necessary to add a new chapter. Science, which looks to the future, is finding at this crossroads of the New World a most excellent opportunity for new development. Here, where ships and aircraft of all nations converge to pass as through a narrow door, it is far easier for scientific men to come than it is for them to reach most other places in the tropics. For the same reason it is easier to bring in necessary laboratory equipment and supplies. For these reasons, and others, Panama is ideally situated for research in the problems of tropical plant and animal life, both general and applied.

Everybody has heard of Barro Colorado, the hill that was turned into an island, and was set aside as a great animal sanctuary; but only a few persons have ever set foot on it. In the nature of things, an animal sanctuary cannot be opened to crowds of visitors, so the only callers are the few scientists who have to meet the birds and beasts and plants "on business."

But strangely few have heard of two other more recent developments in the Canal Zone, which open to anybody who cares to come many of the privileges reserved to scientists alone on Barro Colorado.

These are the newly opened forest reserve, a dozen miles northwest of the city of Panama, and the Canal Zone Experiment Gardens, nearby. The first of these places is a beautiful slice of virgin

tropical jungle, the very existence of which was forgotten until a few months ago when the builders of a new road stumbled upon it. The experiment gardens were started originally as a plot of ground planted with trees, shrubs and other plants of possible economic or ornamental value in the American tropics. They have now had the study of plant diseases, plant breeding and other botanical problems added to their program, making the place a well-balanced botanic establishment with a strong slant toward the practical side.

Endless Wonder

For the visitor from the United States or any other land in the temperate zone, pausing in his voyage down to the west coast of South America, or perhaps from New York to San Francisco, these gardens will be a source of endless wonder and delight. Here you will see, growing casually in the open, plants that you may have heard of but have never before laid eyes on.

You will see, for example, that tree of glamorous South Sea associations, the breadfruit—Heaven's gift of daily bread to the careless happy heathen, and first cousin to the thorny Osage orange.

You will see the famous Traveler's Tree from Madagascar, a beautiful huge fan of banana-like leaves that looks for all the world like an artificial ornament from the throne-room of some gorgeous black sultan of the Arabian Nights. It is called traveler's tree because it is almost always possible to find cupfuls of drinkable water in the angle between the hollow stem-bases and the trunk—good cool water too.

You will find there the mangosteen, a fruit so delicious that it might have grown on one of the trees of Paradise and one which will soon be familiar to all. The trees are just about to come into bearing and a method of transporting the fruit is now known.

With these and a host of other exotic fruits and flowers, that are only names until you take a holiday in the tropics, there will be some more familiar things, that already figure largely in temperate-zone markets. Bananas are common-

place in the gardens. There are also experimental plantings of pineapples, for the big growers of Hawaii are hunting new lands to supplement their island holdings. Rubber trees, too; and sugar cane, rice, coffee—the list might be extended without end.

When you leave the experiment gardens and follow the short stretch of road that takes you to the forest reserve, you find the picture changing entirely.

In the forest reserve everything stands as it did when the startled Indians peered through the trees at Balboa's hardy explorers in their clanking armor. The towering trees are the native lords of the land, rich in their own green robes and in the splendor they borrow from the armloads of orchids and airplants and cable-like vines with which their limbs are burdened. Birds like moving jewels flash through their tops and an occasional clan of monkeys travels along aerial highways a hundred feet above ground. In the deep shade beneath a quieter ground life dwells, sometimes frolic and gamesome, sometimes sinister and desirous of blood.

Athwart the fine new road that the American engineers have built, there runs another, 500 years old, constructed in the name of a Spanish King as the old roads of Spain were built in older days in the names of Roman Emperors. This



WHISPERING AISLES

Of bamboos await the traveler who stops off at Panama to see the botanic gardens.

is the Camino Real, the King's Highway, and once it knew the tread of many patient feet, human and hooved, bearing heavy loads of the wealth of the Indies from a laden galleon on the South Sea to a waiting galleon on the Spanish Main, while their guards looked to their matchlocks and muttered bits of prayer to the saints for protection against possible lurking English marauders.

If you want to see anything of the wild life in the forest reserve, you will have to go silently. For the wild things hear voices and see movement at astonishing distances, and if you do not hush them, they will, and you will pass them by, seen yourself but unseeing.

What the patient and speech-forbearing visitor may see in the newly accessible forest is well and richly foretold in the many scientific studies that have been conducted on Barro Colorado by such naturalists as Dr. Frank M. Chapman and Dr. Frank Lutz of the American Museum of Natural History, Paul R. Standley, botanist at the Field Museum and Dr. Thomas Barbour of the Museum of Comparative Zoology at Harvard. Dr. Chapman has caught some of the flavor of his enthusiasm in a book which he calls "My Tropical Air Castle."

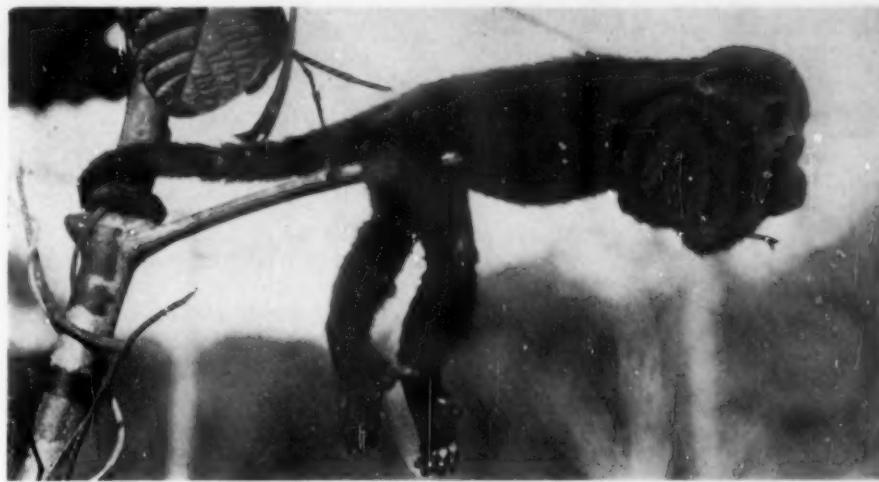
Trees Full of Birds

If you walk circumspectly, and (preferably) carry a good pair of field glasses, you will be able to see much of the interesting life of the jungle. Parrots you will hardly avoid seeing—and hearing. If they take alarm and fly from one treetop to another, they will advertise their going with the ear-splitting din that makes every zoological garden's parrot house a Bedlam.

You may have the luck to find a nest-tree of the oropendola, a great builder of hanging nests that put even the workmanship of our Baltimore oriole to shame. The oropendola is a fairly big bird—the male some fifteen inches long—dark-colored, marked with yellow, very social in its habits. A whole colony of them will build in the same tree, making it look as though the children of some extraordinarily long-legged family of giants had hung up their stockings on Christmas eve.

With rare luck you may see a specimen of the beautiful white hawk, that seems to let other birds pretty much alone and feeds mainly or wholly on snakes.

Toucans you are likely to see, though again you will have to use your field-glasses, for this bird that is mostly beak is another hunter of the tree tops. Dr.



IL PENSERO

Young howling monkey, in a Barro Colorado treetop, studies men while they study him.

Chapman discovered the only known use for this apparently overgrown organ. It is a grand help to a lazy bird, for a toucan can sit on a branch and merely by turning his head—hardly even stretching his neck—gather in fruits and berries from a wide radius around him.

Conspicuous among the treetop inhabitants are the monkeys—principally two, the active, acrobatic Capuchins and the slower, more deliberate but very decidedly noisier howlers. The howling monkey does not exactly howl; his call

is more like a half-yelping bark, and he utters it very abundantly, especially just about dawn and when a rain roars upon the leafy roof of his trees.

The dominant dwellers of the forest floor are of course the furred and footed closer kindred of man, the mammals. Some of these are not hard to find. The coati, for example. If you hear a patterning, a rustling, a mild crashing in the underbrush, stand still and a little flock of coatis will very likely come to you.

The coati is a relative of the familiar raccoon, and looks (*Please turn page*)

ASTRONOMY

Most Distant Visible Nebula Seen by Palaeozoic Light

A "PALAEZOIC PICTURE," a photograph made with light which is supposed to have started toward the earth 300,000,000 years ago, has been shown by Dr. Edwin P. Hubble, of the Mount Wilson Observatory in a lecture at Princeton University.

It was a photograph of the most distant nebula yet studied by astronomers and it was made with light that left the "island universe" on the fringe of known space at about the time when coal was in the making here on earth.

The achievement of a giant telescope in amplifying our knowledge of the material universe was depicted by Dr. Hubble in the Vanuxem lectures on "The Exploration of Space." Observational astronomy, once concerned chiefly with the solar system, then with the stars in

our Milky Way or galaxy, is now, he declared, entering upon a third phase—the accurate description of the extra-galactic nebulæ.

Thirty million of these, he estimated, lie within 300,000,000 light years of our own galaxy. These thirty million nebular "neighbors" are scattered through this vast space more or less at random; but on the whole their distribution is homogeneous and isotropic, according to the careful statistical study he has been conducting at Mount Wilson. The hundred-inch reflector there can penetrate no farther into the depths of space, and speculative conjectures are our only guide at present when we consider what lies beyond the observational frontier, farther away than 300,000,000 light years.

Science News Letter, December 12, 1931

TEACHERS COLLEGE



The College of Liberal Arts and Sciences

*The Degree of
Bachelor of Arts*

Standard Curriculum based on best academic experience. Embraces the six great fields of learning, Pure Science, English Language and Literature, Mathematics, Foreign Languages, History and Philosophy.

EVENING COURSES OFFERED

- | | |
|----------------------------------|-------------------------|
| 1. Chemistry | 4. Mechanical Design |
| 2. Heat Treatment and Metallurgy | 5. Architectural Design |
| 3. Construction | 6. Aviation |

For further information send for Bulletin on courses in which you are interested

TEMPLE UNIVERSITY

Broad Street at Montgomery Ave., Phila., Pa.



very much as a raccoon might look if its nose and tail were stretched out to about four times their usual length. The coati is quite fearless, and like the raccoon exceedingly curious. He will investigate anything, making off through the forest at surprising speed if it looks suspicious upon closer examination.

Another forest-floor beast you may find, wandering in small droves, is the peccary, or wild pig. Though there is never any freezing weather on the Isthmus, this creature is always as independent as the traditional hog on ice. It is a formidable fighter when necessary, and doesn't yield the road to anybody.

But many of the creatures that are in the forest you will never see by daylight. Either they see you first, or hear, or smell you, and quietly keep out of your way, or they do not roam abroad by day at all.

To get records of these nocturnal prowlers, the Barro Colorado scientists have resorted to "trapping by camera"—setting up a camera with a big charge of flash powder and a string-and-trigger arrangement for firing it when an animal touches the string. This has obtained superb photographs of such rarities as the tapir, that strange animal that looks like the Elephant's Child before the Crocodile pulled his nose; the puma and the ocelot, the two big cats of the region; and the trouser-legs and shoes of a night-wandering man, a trespasser who hadn't any business on the island. If that chap didn't know what a camera-

PHOTOGRAPHY

Ultraviolet Light Used In New Photographic Process

PHOTOGRAPHIC plates sensitive to ultraviolet light will shortly be made commercially by a new process, Dr. C. E. K. Mees of the Eastman Kodak Company has reported.

"Schumann" plates used for this purpose till now were difficult to make and had to be prepared by hand. They had a coating either entirely free from gelatine or containing only a small trace of gelatine to bind the silver bromide.

In order to avoid the use of Schumann plates, two Frenchmen, Duclaux and Jeantet, suggested the treatment of ordinary plates with a fluorescent substance which glows when exposed to ultraviolet light, and they employed petrol-



SUPERBLY BEAUTIFUL

Yet this white hawk of the Panama jungle feeds almost entirely on snakes.

trap set-up is, he must have thought a whole battery of artillery had opened on him when that big flash went off. He never came back to report his reactions.

This article was edited from manuscript prepared by Science Service for use in illustrated newspaper magazines. Copyright, 1931, by EveryWeek Magazine and Science Service. Photos copyright by D. Appleton Co., publishers of "My Tropical Air Castle," by Frank Chapman. *Science News Letter*, December 12, 1931

eum oils to paint it on the plates. Satisfactory results have been obtained by many workers with petroleum, but it is difficult to apply the oil uniformly and to remove it before development.

R. E. Burroughs of the staff of the Kodak Research Laboratories tested a large number of organic substances and found the most suitable to be ethyl dihydrocollidine dicarboxylate, which fluoresces strongly in the ultraviolet. This substance can be applied in organic solvents, from which it crystallizes in microscopic crystals over the surface of the plate, these crystals being easily removed before or during development.

Science News Letter, December 12, 1931

ENGINEERING

Cheap Coals, Reduced to Powder, Make Superior Fuel

Tests Show That Economies of Big Power Plants Can Be Brought to Locomotives and Steamships

DIRTY, cheap coals so useless that they can almost be had for the asking, become the source of hotter fires than costly anthracite can make, if they are ground up to dust and blown into the firebox with air enough to make them burn. How such coals have been used to save money for railroad and steamship companies was told at the Carnegie Institute of Technology by engineers attending the Third International Conference on Bituminous Coal.

The hard-pressed railroads may expect their coal bills to be much lower if they will burn their fuel in pulverized form, John C. Chapple, consulting engineer of St. Louis, said before the conference.

"There is no reason," Mr. Chapple declared, "why higher boiler pressures and superheat, multiple expansion, and pulverized fuel will not at least double the over-all efficiency of the locomotive during the next few years."

He described the use of pulverized coal on test locomotives of the Missouri-Kansas-Texas railroad, and reported a saving of from 20 to 25 per cent. In the most satisfactory installation the coal was ground in a pulverizer on the tender just before it was mixed with a stream of air and fed into the firebox. Powdered coal makes possible a hotter fire in a smaller firebox than can be obtained with hand firing.

The chief disadvantage in its use lies in the fact that most of the ash goes up the smokestack as very fine, sharp particles, which when breathed in sufficient quantity may be injurious to health. On shipboard, however, there is little objection to the ash, because it is lost over the water. The use of powdered coal afloat was reported by C. M. Stein of Paris and by R. J. McKechnie of Boston. Both described experiences of the few pulverized coal burning vessels already in operation, stating that great savings were being effected. A disadvantage of powdered coal when it has to be stored is the ease with which it takes fire; this has been put to good use in the coal-dust motor.

If coal is powdered finely enough, sprinkled lightly over a piece of paper and left in the air for a few minutes, it will slowly change into a white ash. It is not necessary to touch a match to it. So the danger of stored powdered fuel igniting from spontaneous combustion is great.

Science News Letter, December 12, 1931

PUBLIC HEALTH

Study Shows Cancer Varies With Nationality

CANCER DEATHS are more frequent and the disease probably more malignant in some countries than others, it has been learned from one of the many studies of the Health Organization of the League of Nations, Dr. Victor G. Heiser of the Rockefeller Foundation said in describing the work of this organization at the De Lamar lecture of the Johns Hopkins School of Hygiene.

This cancer inquiry of the League's Health Organization showed that the differences in the number of cancer deaths in different countries are real and not necessarily due to better diagnosis in one country than another. The rates of cancer mortality are lower in the Netherlands and in Italy than in England, is another fact brought out by the study. Furthermore, cancer is more prevalent in the United States among families of British origin than those of Italian origin. Again, cancer of certain types is much more prevalent in some countries than in others. Facts like these, discovered by study of data made available through international cooperation, may eventually lead to the key of the cause of cancer, Dr. Heiser pointed out.

Science News Letter, December 12, 1931



ANCIENT AMERICANS

The Archaeological Story of Two Continents

BY EMILY C. DAVIS

Miss Davis, writer on archaeological subjects for *Science News Letter*, has written a book which discusses thoroughly and absorbingly all the varied and exciting archaeological aspects of pre-historic North and South America. "Curiously enough until now there has been no single work covering the whole bewildering varied Indian world as it was in pre-Columbian days. Miss Davis has therefore done both the general public and archaeology itself a real service . . . she has the happy ability to pack her book closely with facts without losing the leaven of easy readability. The illustrations are well chosen."—*Science News Letter*. \$3.50.

MAGIC SPADES

The Romance of Archaeology

BY R.V.D. MAGOFFIN AND
EMILY C. DAVIS

"I know of no better and more up-to-date, brief popular account of the recent great finds of Archaeology for the cultured public."—David Moore Robinson, Professor of Archaeology, Johns Hopkins University. \$5.00.

Both volumes \$7.50, to readers of the *Science News Letter*, if order is accompanied by this advertisement.

HENRY HOLT AND COMPANY
One Park Avenue - New York City

SPENCER SCIENTIFIC AND EXPERIMENTAL WORKS
4503 Wolff Street, Denver, Colorado
Optical Engineering and Designing
Repairing and Special Work
Assistance in Experimental Work
Instruction in Technical and Scientific Subjects
Astronomical telescopes, reflectors, prisms, gratings, lenses, standard flats, gauges, optical instruments, supplies, patterns, castings, agate work, crystal specialties, testing, and used equipment.

PHYSIOLOGY

Means Found for Measuring Amount of Vitamin B Needed

A MATHEMATICAL formula which will enable scientists to determine how much vitamin B you need in your diet to protect you from beriberi and which will show whether your ordinary dietary contains enough of this precious anti-neuritic vitamin was reported to the National Academy of Sciences meeting by Prof. George R. Cowgill of Yale University.

Heretofore the only way of telling whether a diet contained enough vitamin B to protect against beriberi has been the rather negative method of observing whether or not persons living on that diet developed the disease.

Using a vitamin B concentrate prepared from yeast, and determining the minimum amount of the substance required each day by a mouse, a rat, a pigeon and a dog, Prof. Cowgill was able to arrive at his formula expressing the vitamin B requirement per day.

Tested by Four Methods

"The vitamin B requirement may be regarded, provisionally, as proportional to the total metabolism multiplied by a factor correcting for age," he said.

The formula was worked out on the requirements of animals which could be determined directly, but Prof. Cowgill reasoned that it could also be applied to man and tested this theory by four methods: using the formula to estimate the daily vitamin need of men of different body weights; by calculating the vitamin B content of various representative human diets, expressing the results in terms of equivalents of vitamin B concentrate used in the animal tests; by noting, on the basis of these calculations, whether the diets should have allowed or prevented human beriberi; and comparing these results with the observed facts concerning the incidence of this disease.

For example, a man weighing 154 pounds and living on an average American diet would be receiving a daily vitamin intake equivalent to 8.2 grams of the test concentrate. Such a man's requirement, according to the formula, would be 6.47 grams, and therefore, he should not develop beriberi. Actually, beriberi occurs very rarely in the United States, which seems to prove the ac-

curacy of the calculations and the formula on which they were based.

A similar result was obtained using the average German dietary, which agrees with the fact that beriberi is also rare in Germany.

A study of the data in North China dietaries shows that the factor of safety is even greater in this case than in Germany and America. This finding is in agreement with the fact that in contrast to the Southern Chinese, who eat large amounts of white rice and among whom beriberi is very prevalent, the Northern Chinese people make liberal use of cereals, soybeans, vegetables and fruits and show relatively few cases of beriberi.

A study of the exclusive meat diet eaten by the explorer, Vilhjalmur Stefansson, for over a year without the appearance of beriberi showed that the diet was adequate, although the factor of safety against beriberi was only moderate.

Prof. Cowgill reported other similar instances in which his calculations of a dietary's vitamin B content agreed with its known action in producing or preventing beriberi.

Science News Letter, December 12, 1931

FORESTRY

Forest Fire Fighters Drill Their Own Wells

MICHIGAN forest fire fighters last season developed a system of obtaining water for fighting ground fires by drilling shallow wells when no other nearby source was available. On many occasions it was found possible to sink a well from three to eight feet into the ground in a short time and thus obtain sufficient water to keep a ground fire or a muck fire under control.

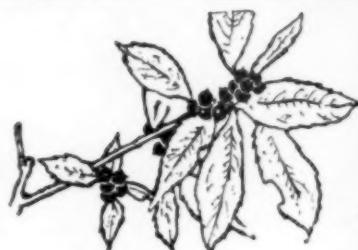
The use of this system, of course, depends upon the height of the water table. When it is low the pump system cannot be used, but in ordinary seasons it has been found that a well point sunk a few feet into the ground will furnish enough water to fill portable tanks and pails. An ordinary "pitcher" pump or a gasoline pump is used to lift the water to the surface.

Science News Letter, December 12, 1931

BOTANY

Nature Ramblings

By FRANK THONE



WINTERBERRY

CHRISTMAS is already occupying a considerable place in the thoughts of children, and therefore of necessity in the activities of those who cater to the Christmas trade. Even now the gatherers of holly and other Christmas greens are beginning to get their wares together, for in many cases these decorations must be shipped hundreds of miles, which takes a lot of time. Holly grows wild throughout the South, and extends along the Atlantic seaboard as far as the southern end of New England, but inland it does not grow at all.

We have become so used to thinking of holly as a mild-climate plant that it surprises us a little to learn of a native American holly that thrives perfectly well in the winter climate of the North, even in the upper Mississippi Valley. We do not recognize it as a holly, because it does not have the hard, glossy, prickly leaves of our old familiar Yule-tide friend, and because its softer foliage changes color and drops off in late autumn, in orthodox fall-leaf fashion. But the winter-berry is a true holly none the less, as will be recognized in a moment if one examines the round, red, glistening berries with which its slender stems are beset.

The winterberry does not reach tree size, as the Christmas holly does; it is never more than a tall and somewhat straggling bush. It is found from Nova Scotia south to Florida, and westward as far as Missouri.

Like most of our other bright-berried shrubs, the winterberry has suffered considerably from the depredations of commercial collectors. The American Wild Flower Preservation Society urges that private individuals refrain from taking it, and that they refuse to buy it when it is offered on the market.

Science News Letter, December 12, 1931

PHYSICS

**Tracks of Cosmic Rays
Seen by Experimenters**

TH E COSMIC RAYS, piercing radiations from the distant heavens, have been seen. At least, the straight paths along which they travel were made visible in experiments reported to the American Physical Society at Minneapolis by Dr. L. M. Mott-Smith and G. L. Locher of the Rice Institute, Texas.

Bullet-like corpuscles must form the problematical cosmic rays, conclude

these investigators, from their observations of these thin straight tracks of rapidly moving particles.

The famous Wilson cloud expansion chamber, which has been used to spy even on colliding atoms, was used by Dr. Mott-Smith and Mr. Locher in these experiments to make visible the paths of the rays. In a strong light they appear as trains of water droplets.

Simultaneously with the formation of each bullet-track a signal was observed in an electroscopic instrument known as a Geiger-Müller counter, used to detect the arrival of these

messengers from the depths of space.

Only a fast material particle like an electron could score such double hits, says the experimenters. They are "non-material" waves like the gamma rays from radium, however, in the opinion of Dr. R. A. Millikan, leading American investigator of the cosmic rays.

Supporters of the wave theory of the rays believe that their particle-like behavior is not due to the direct action of the rays but to secondary electrons driven out of air atoms encountered by the rays.

Science News Letter, December 12, 1931

You can pay for this Christmas Gift any time between now and February 15, 1932!

YOU want to give generous gifts to certain of your friends or relatives, yet gifts which are not unduly costly in these days of economy. Many others of our subscribers have the same idea—we know this beyond peradventure because last year so many of them selected SCIENCE NEWS LETTER for use as gifts.

SCIENCE NEWS LETTER is not like merely material presents—it is a gift to the mind. What more sincere compliment can you pay than to show them you appreciate their interest in worthwhile mental pleasures.

Our part in the use of SCIENCE NEWS LETTER as a gift is to make it as convenient as possible for you to pay. Pay with your order on the order blank below, or any time up to February 15, 1932.

| | Each |
|---|--------|
| Yearly subscriptions | \$5.00 |
| TWO one-year subscriptions | 3.50 |
| One yearly gift subscription and your own renewal | 3.50 |
| Two-year subscriptions | 7.00 |
| Two-year renewals | 7.00 |

Send your own renewal with your gift order. You save money by doing so.

— — — — Christmas Gift Coupon — — — —

To SCIENCE NEWS LETTER,
21st and Constitution Avenue,
Washington, D. C.

Please enter the following subscriptions to Science News Letter, for which I enclose check; I will pay not later than February 15, 1932.

GIFT TO

Name
Street
Address
City and State 1 or 2 yrs.?

AND ENTER MY RENEWAL AT THE REDUCED RATE, for years from present date of expiration.

My Name and Address—

My Name

Street
Address

City and State

No extra postage charges to anywhere in the world 16062

• First Glances at New Books

Anthropology

SOURCE BOOK IN ANTHROPOLOGY—A. L. Kroeber and T. T. Waterman—*Harcourt, Brace*, 571 p., \$3.75. Fifty-five notable papers by noted scientists. Some appeared years ago and are with difficulty found in print nowadays. Some are recent, as Dr. Douglass' report on the tree ring calendar. The papers have been chosen because they have the value of stimulating discussion. The editors disclaim any intent to cover the broad field of anthropology, but any student who has read these contributions by such men as Darwin, Galton, Boas, Holmes, Hrdlicka, Nordenskiöld, must gain a new understanding of the larger problems of anthropological science. This is a revised edition, considerably different from earlier printings.

Science News Letter, December 12, 1931

Physics

ELECTRICITY, WHAT IT IS AND HOW IT ACTS—A. W. Kramer—*Technical Publishing Company*, 2 vols., 271 and 290 p., \$4. This book is designed to tell the layman just what the science of electricity is like after the revolution of the last thirty years. Full weight is given to the new views. Practically no mathematics is used, but the diagrams and explanations are clear and convincing. The author is associate editor of "Power Plant Engineering" in which periodical the material was first published serially.

Science News Letter, December 12, 1931

Psychology

ANIMAL DRIVE AND THE LEARNING PROCESS—Edwin B. Holt—*Holt*, 307 p., \$2.50. The subtitle, "An Essay Toward Radical Empiricism," indicates the purpose of the work. It is dedicated to Morton Prince and was originally intended by the author as a tribute to his friend on his seventieth birthday. An interesting and enjoyable book.

Science News Letter, December 12, 1931

Psychic Research

HUMAN EXPERIENCES—Walter Franklin Prince—*Boston Society for Psychic Research*, 311 p., \$3.50. To some ten thousand men and women listed in "Who's Who in America" the Boston Society for Psychic Research sent a questionnaire asking if they ever had any psychic experiences for which no "normal" explanation was apparent. Of the 2,693 responses, 430 were affirma-

tive. In this report, the returns are analyzed statistically according to age, education, occupation, religious belief. Following are printed the cases of apparitions, dreams, "monitions," and "premonitions" which were thus obtained, together with Dr. Prince's comments.

Science News Letter, December 12, 1931

General Science

SCIENCE TODAY—Edited by Watson Davis—*Harcourt Brace*, 310 p., \$2.50. In their original form the 67 chapters that compose this book were read by various eminent men of science as Science Service radio talks. Before inclusion in the book they were carefully revised by their several authors. This volume, therefore, will present the latest news and views, crisp as a head of new lettuce, on all manner of things that are in the heavens above, in the earth beneath and in the waters that are under the earth.

Science News Letter, December 12, 1931

Ornithology

THE RED BOOK OF BIRDS OF AMERICA; THE BLUE BOOKS OF BIRDS OF AMERICA; THE GREEN BOOK OF BIRDS OF AMERICA—Frank G. Ashbrook, illustrations by Paul Moller—*Whitman Publishing Co.*, each volume 96 p., 10c each. This series of little books, each one literally of vest-pocket size, includes most of the birds the non-professional naturalist is likely to encounter in his walks afield. Although the colored illustrations are not exactly those of a first-edition Audubon, it is astonishing that colored pictures could be supplied at all at the low price at which the books are offered.

Science News Letter, December 12, 1931

Child Study

THE INFANT WELFARE MOVEMENT IN THE EIGHTEENTH CENTURY—Ernest Caulfield—*Hoeber*, 203 p., \$2. Those were the days when it was commonplace for unwanted babies to be exposed in the streets to die, and when 75 per cent of the infants christened in London were said to die before the age of five. The eighteenth century, however, also marked the beginnings of that interest in child welfare which has taken such enormous strides in recent years. The author gives an interesting description of both the ignorance and the progress of that time.

Science News Letter, December 12, 1931

Archaeology

THE TEMPLE OF THE WARRIORS—Earl H. Morris—*Scribner*, 251 p., \$5. Without much exaggeration, this might be called something new in writings on archaeology. Mr. Morris tells with a nice dramatic swing the story of one heroic-size archaeological project—"the adventure of exploring and restoring a masterpiece of native American architecture in the ruined Maya city of Chichen Itza, Yucatan." But as he unfolds the adventure, he interrupts himself now and again. He pauses to explain some point about the ancient Mayas or to tell some incident showing what the life of a field archaeologist is like. The book thus becomes an informal and attractive introduction not only to the ancient Mayas but to modern archaeologists as well.

Science News Letter, December 12, 1931

Chemistry

ELECTROCHEMISTRY, PRINCIPLES AND PRACTICE—C. J. Brockman—*Van Noststrand*, 348 p., \$4.00. This is an elementary presentation of the theory and current practice of electrochemistry designed as much for the industrialist interested in the possible developments in this field, as for the chemist. The volume is one of the new series of industrial chemical monographs of which three have so far been published.

Science News Letter, December 12, 1931

Medicine

THE FOREST HOSPITAL AT LAMBARENE—Albert Schweitzer—*Holt*, 191 p., \$2. Dr. Schweitzer founded the hospital in West Equatorial Africa in 1913. In this volume he tells of his work there since 1924. The tale is as fascinating as any adventure story and gives a vivid picture of life in that part of Africa. All Dr. Schweitzer's profits from the sale of the book go to the hospital, according to the introduction by his friend, Dr. Karl Reiland of St. George's Church, New York.

Science News Letter, December 12, 1931

Botany

FIELD WORK FOR THE LOCAL BOTANIST—A. S. Hitchcock—*Author*, 58 p., \$1.10. The price of this book as given in the review note published in the SCIENCE NEWS LETTER for October 3 was given as \$1 through an error, which it is desired to correct.

Science News Letter, December 12, 1931